Review STE/ST Lab EXAM **Name** _____

KEY CONCEPTS FROM STE LABS

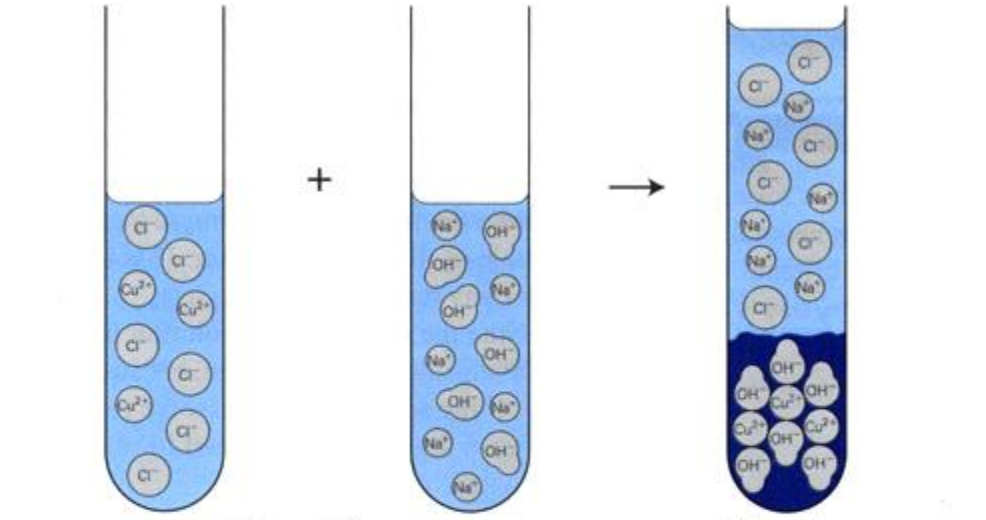
1. Avogadro Number Lab

- From the positions of $^{12}C^{+}$ and $^{1}H^{+}$ on the mass spectrum you can find out how much heavier $^{12}C^{+}$ is compared to $^{1}H^{+}$.
- Since $^{1}H^{+}$is a proton and since we know the masses of the proton and the electron from Thompson, we can easily calculate the mass of a ^{12}C atom.
- A mole is the number of atoms in 12.000 g of ^{12}C
- 12.000 g/mole ÷ 1.993 X 10^{-23} g/atom= 6.02 X10^{23} atoms/mole

2. Baking Soda Lab $NaHCO_3 + HCl \rightarrow H_2O + CO_2 + NaCl$

- The lab was done to test stoichiometry
- We added more than enough acid to eliminate all of the $NaHCO_3$ (weighed).
- All of the CO_2 escaped immediately.
- But we were stuck with leftover HCl, and remaining products: NaCl and water.
- With heat, we drove off HCl and H_2O
- The blue -> red litmus paper test revealed that acid(HCl) was evaporating.
- Once we get NaCl's mass, we compared it to what stoichiometry predicted based on the moles of $NaHCO_3$ that were weighed.

3. A Precipitation Reaction How does it happen? Write an equation.



4. The Phosphorus Lab

- Certain chemicals react with phosphates to produce colored compounds. Depending in the concentration of PO_4^{3-} in a sample, the color of the solution can range from shades of light green to deep blue.
- Acid had to be added becuase the reagent won't react at alkaline pH's and phosphates are basic.
- Phosphates are found in grey water, which includes bath water, dishwashing water and laundry water. The ions can come from phosphates added to detergents and soaps or from food.
- An interesting additional experiment could involve testing grey water before and after it went through the roots of various plants.
- Phosphates let out into lakes and rivers could lead to eutrophication.

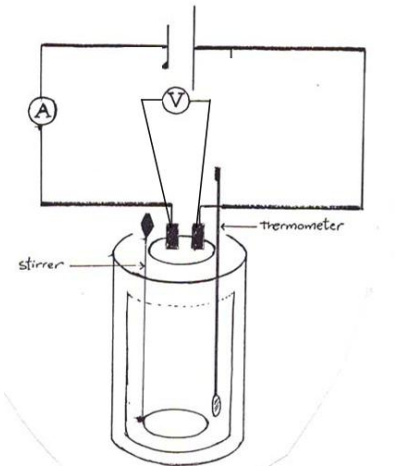
5. Mystery Box

Three identical resistors are hooked up to a 12.0 V source. The following measurements are recorded: $V_1 = 12.0$ V $V_2 = 6.1$ V $V_3 = 6.0$ V.

Draw the circuit. (R_2 and R_3 are in series but R_2 and R_3 are parallel to R_1) The 0.1 V difference is due to experimental error.

6. Calorimetry

a)Explain the purpose of using a calorimeter hooked up to a power source.
By measuring voltage , current and time in seconds, we can calculate the electrical energy going into the calorimeter. By measuring the temperature change of the water in the calorimeter, the mass of water whose specific heat is known, we can compare the two amounts to see howmuch electrical energy is converted to heat and absorbed by water.



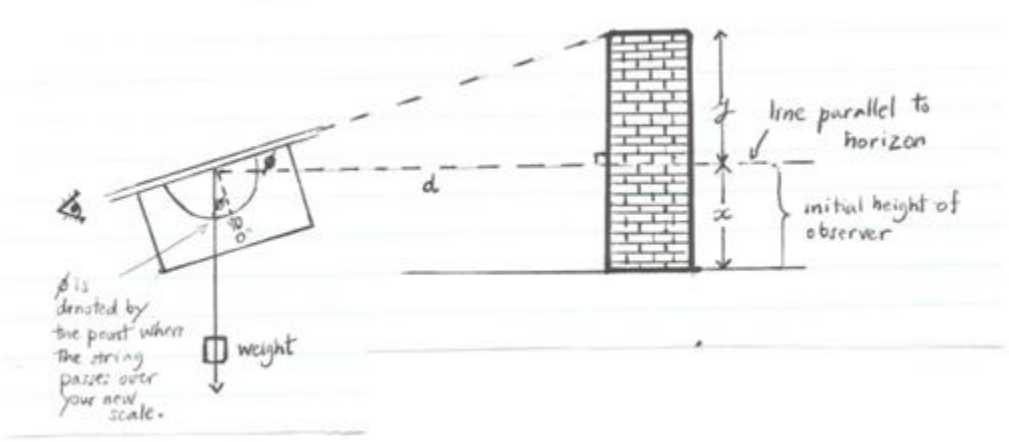
b) What else can it be used for? It can be used to come up with a rough estimate of the specific heat of an unknown liquid if we assume that E = Q.

7. **Genetics**

- For any measurement(example hand size, bean size) there are always variations.
- There will be more individuals closer to the average.
- A histogram of the results looks like a bell curve.
- Although there is usually an advantage to be at one extreme, there is also a disadvantage. For example if beans are large, it gets the seedling off to a good start, but at the same time producing only large beans is too much of an energy investment for the parent plant. Small beans save energy, but too small a size places the seedling at a disadvantage.

8. **The Clinometer and Measuring Gravitational Acceleration**

- Trying to time the fall of an object from too low a height will increase error of measurement. If the uncertainty, for instance, is $\pm 0.1\ seconds$ and it takes only 0.3 seconds for a rock to fall, the error will be 33%. The same uncertainty for a 1.1 second fall will be 9%.
- To measure the height from a high place, a clinometer can be used. The angle and tangent ratio can be used to estimate the height. Then $g = 2h/t^2$



- The clinometer reminds us that gravity acts at 90° to the horizon.